

**IN THE SPECIFICATION:**

Please insert the following subheading after paragraph [0001]:

**BACKGROUND OF THE INVENTION**

Please delete the subheading before paragraph [0003] and replace with the following new subheading:

**DESCRIPTION OF THE RELATED ART**

Please amend paragraph [0003] as follows:

For one of the schemes for three-dimensional television that allows the three-dimensional vision from any ~~arbitrat~~ of arbitrary viewing points, an IP (Integral Photography) three-dimensional camera device that uses a micro lens array apparatus or a pinhole array apparatus has been known. As one of applications of this IP three-dimensional system, a technology has been known wherein a radially graded refractive index rod lens (called a "radial GRIN lens", hereinafter) which has a particular optical length (for example, a Japanese published patent application, H12-122191). The three-dimensional camera device according to this patent application uses optical fibers instead of the radial GRIN lenses, wherein the effective optical length of the fiber is set a half cycle or an odd cycle of the meridional serpentine period and the graded refractive index of the optical fiber has the characteristic of quadratic distribution to maintain a coherent guided mode of the optical wave traveling therein.

Please amend paragraph [0011] as follows:

In the above first and the third references, the depth magnification is fixed to be a negative unity or a positive unity and no change of the magnification of the reproduced image is possible ~~[[since]]~~ because the system is constructed in such a way that the subject image is reproduced through the transmission guide which has a fixed afocal characteristic. In addition, the conventional three-dimensional optical image cannot be reproduced close to or far from the elementary image optical subsystem that reproduces the three-dimensional optical image. As the result, the conventional technology has ~~[[the]]~~ problems in terms of the fixed and non-adjustable depth magnification.

Please amend paragraph [0012] as follows:

In the second reference as given in the above, it is not possible to create a three-dimensional image but only a planar image. Moreover, ~~[[since]]~~ because a means to create a uniform colored background is additionally necessary in order to image a planar image, more optical components are required in order to complete a set of the apparatus. It is not possible to display the subject as it is ~~due to~~ as a result of having a means of uniform colored background. The additional means of the uniform colored background is not intended to reproduce the three-dimensional images and has a different system design from those to generate three-dimensional images.

Please amend paragraph [0013] as follows:

There have been no appropriate conventional technologies of the optical apparatus to satisfy the requirements to be used for the application for the case when [[the]] radiation materials or explosive materials are handled by remote controlled manipulators or magic handles in nuclear power plants or power factories and for [[the]] requirements such that visitors are able to see the art works and exhibits in close view even when they are forced to be apart from the exhibiting subjects in the museums.

Please amend paragraph [0014] as follows:

The present invention has been proposed to solve the issues seen in the above. The purpose of the present invention is to provide a new three-dimensional image optical system that allows ~~to adjust~~ adjustment of the position of the three-dimensional optical image reproduced without fixing for the depth magnification of the subjects and allows to visually observe the subjects in detail at the location apart from the subjects without using a means of uniform colored back ground.

Please delete the subheading before paragraph [0015] and replace with the following subheading:

SUMMARY OF THE INVENTION

Please amend paragraph [0015] as follows:

The three-dimensional image optical system according to the present invention has the following construction in order to achieve the purpose described above. That is, the elementary image optical subsystem is constructed with plural afocal optical elements that have the first optical component and the second optical component both aligned in a common optical axis. An optical converging point for both the first and the second optical component locates in the common optical axis so that ~~[[the]]~~ afocal characteristics are obtained. If one of the optical components has no converging property but a diverting property then the virtual focal point may locate in the common optical axis as well. In this optical configuration, the ~~plural~~ plurality of afocal optical ~~element~~ elements is placed in a planar array to form an elementary image optical subsystem. Then a plurality of the first optical components ~~[[is]]~~ are aligned to form the first optical component plane and a plurality of the second optical components ~~[[is]]~~ are aligned to form the second optical component plane.

Please amend paragraph [0016] as follows:

~~[[Since]]~~ Because the afocal optical element has the afocal property, the light emitted from a point of the subject travels to the spatial point of the other side of the afocal optical element and ~~[[then]]~~ is then converged into a light point as an image point of the subject. Therefore, the afocal optical element has the capability to reproduce the light from the subject in the other side of the afocal optical element. ~~[[Since]]~~ Because the elementary image optical

subsystem is composed of the plural afocal optical elements, the three-dimensional image of the subject which is placed in the side of the first optical component plane is reproduced in the side of the second optical component plane as an assembly of the image points covering the subject.

Please amend paragraph [0017] as follows:

[[Since]] Because the light convergence or divergence property is required for the optical components, optical lenses such as convex lenses, concave lenses, radial GRIN lenses and cylindrical lenses are used other than the optical fiber lenses used for the conventional technology.

Please amend paragraph [0019] as follows:

The variation of the magnification of the three-dimensional image is designed by the focal distances of the first optical components and the second optical components in predetermined distances with a variety of [[ratio]] ratios. In addition to the conventional magnification concept that is a depth magnification of the subject presented by the angle of the light to reproduce the three-dimensional image in the side of the second optical component plane, another magnification concept that is a depth magnification regarding the three-dimensional virtual image is provided. Therefore, it is possible to reproduce the magnified or shrunk image of the subject and to reproduce the image of the subject in non-facing orientation. This is a new technology of image reproduction called a "depth-reverse image".

Please amend paragraph [0020] as follows:

The present invention has further advantage ~~to provide~~ of providing a reproduced image of the subject in a horizontal direction but a diverted image as is from the original subject in the vertical direction by using cylindrical lenses.

Please amend paragraph [0021] as follows:

The afocal optical element may be composed of a pair of a convex lens and a concave lens. By this configuration, a new depth magnification, that is ~~[[the]]~~ a different sign of magnification from the conventional technology, is possible.

Please amend paragraph [0022] as follows:

The present invention has a further advantage that the focal point from the radial GRIN lens, that is called the focal distance hereinafter, can be varied by selecting the length of the radial GRIN lens. Therefore, it is possible to make a variation of depth magnification by designing the length of the radial GRIN lens and setting the location of a pair of the radial GRIN lenses. In this designing practice, it is possible that the radial GRIN lens located in the first optical component works as a convex lens and that in the second optical component as a concave lens. Therefore, the new depth magnification, that is ~~[[the]]~~ a different sign of magnification from the conventional technology, is possible as well.

Please amend paragraph [0023] as follows:

As for the specific design of the length of radial GRIN lenses, meridional serpentine light path is the major design parameter. The ruling dimension of the light path is a serpentine period provided by  $P=2/A^{1/2}$  where A is a coefficient given by the material of the radial GRIN lens. In more ~~detail~~ details, the radial GRIN lens works as a convex lens and a concave lens when the optical lengths of the radial GRIN lens  $0 < Z_u < P/2$  and  $P/2 < Z_u < P$ , respectively.

Please amend paragraph [0024] as follows:

The present invention has a further advantage in reproducing a clear image by adding optical gobo element which has the gobo effect to the holder that holds the first and the second optical components.

Please amend paragraph [0025] as follows:

The present invention has another further advantage ~~to reproduce~~ in reproducing the image of the subject in depth-reverse images by using two or even quantity of the elementary image optical subsystem.

Please delete the subheading before paragraph [0036] and replace with the following subheading:

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

Please amend paragraph [0036] as follows:

~~Plural~~ Several embodiments according to this invention will be explained in detail ~~details~~ with ~~referring reference~~ to the drawings. ~~[[The]]~~ FIG. 1 shows a principal side view of an afocal optical element used for the three-dimensional image optical system. FIG. 2 shows the principle of an afocal system configured with convex lenses for use for the three-dimensional image optical system of the present invention. FIG. 3 shows a cross sectional view of the principal portion of the three-dimensional image optical system.

Please amend paragraph [0037] as follows:

The three-dimensional image optical system 1 regarding the present invention comprises an elementary image optical subsystem 3 which is composed of plural afocal optical elements 2 which are aligned in a planar array. The afocal optical element 2 is composed of the first optical component and the second optical component, both of which are aligned on a common optical axis. The focal distances of the first and the second optical components can be same or ~~[[be]]~~ different. However, the first and the second optical components have a common focal point on the common optical axis. For the optical characteristics of this elementary image optical subsystem 3, the first optical component plane and the second optical component plane at the location of the first optical component and the second optical component are defined. They are the symmetrical planes for the convex lenses 12a and 12b, as shown in FIG. 2. Another set of optical characteristics is a hypothetical incidence plane 2a and a hypothetical emission plane 2b



which are shown in FIG. 2. For the system of two convex lenses, the hypothetical incidence plane 2a and the hypothetical emission plane 2b are defined by the forward focal points of the first optical components and the back focal points of the second optical components, respectively. The common focal point ~~locates~~ is located between the first optical component and the second optical component on the optical axis. For the system of the afocal optical element wherein a convex lens and a concave lens are used, the hypothetical emission plane 2b ~~locates~~ is located between the convex lens and the concave lens, as shown in FIG. 6. The common focal point ~~locates~~ is located in the reverse side of the subject from the concave lens.

Please amend paragraph [0041] as follows:

In this optical configuration, a light from a subject locating in the infinity distance comes into the afocal optical element 2 with the incident angle  $\varphi_s$ , then the emission angle  $\varphi_e$  is obtained as shown in FIG. 2. The depth magnification is obtained by the incident angle  $\varphi_s$  and the emission angle  $\varphi_e$ . The three-dimensional image is reproduced by convergence of the lights radiating from a subject  $Q_s$  into an image point  $Q_e$ , wherein the elementary image optical subsystem 3 covers large amount of the radiating lights from the subject  $Q_s$ . ~~[[Since]]~~ Because the incident angle  $\varphi_s$  and the emission angle  $\varphi_e$  are different in ~~[[the]]~~ sign, the reproduced three-dimensional image by the elementary image optical subsystem 3 provides a depth-reverse image against the subject. The three-dimensional property of the reproduced image is generated by the plural quantities of the elementary image optical subsystems 3 that provide the viewing angle to

cover the lights emitted from the subject.

Please amend paragraph [0043] as follows:

All lights from the subject Qs to the hypothetic incidence plane 2a are approximately parallel to the optical axis of the elementary image optical subsystem 3. However, more exactly, the incident angles are non-zero as  $\phi_s^1$  to  $\phi_s^3$  as shown in FIG. 3 and [[has]] have a relation with the emission angle  $\phi_e$  at the emission plane 2b at the location side of the afocal optical element 2 with an angular magnification  $\gamma$  as given by the following equation;

$$\gamma = \frac{\tan \phi_e}{\tan \phi_s} \quad (1)$$

Please amend paragraph [0044] as follows:

As shown in FIG. 3, many of the afocal optical elements 2 are arranged to compose an array of the elementary image optical subsystem 3. Then, the lights from the subject Qs (at the 3D position  $(X_s, Y_s, Z_s)$ ) which locates at the distance of  $L_s$  from the array of the elementary image optical subsystem 3 is focused and a three-dimensional image is reproduced at the distance  $L_e$  from the backside plane of the array. The position of Qe is given [[in]] by the equation (2).

$$X_s = X_e \text{ and } Y_s = Y_e \quad (2)$$

Please amend paragraph [0047] as follows:

The depth magnification  $M_p$  given by the equation (6) is a reciprocal of the angular magnification  $\gamma$ . Therefore, it is possible to obtain a desired depth magnification by changing the angular magnification. When the subject  $Q_s$  is ~~[[put]]~~ located apart from the hypothetic incidence plane 2a of the elementary image optical subsystem 3, the intermediate three-dimensional image  $Q_e$  is reproduced at the place apart from the hypothetic emission plane 2b with the same amount of distance. Therefore the subject  $Q_s$  and the intermediate three-dimensional image  $Q_e$  have ~~[[the]]~~ a reverse relation in the distance from the hypothetic incidence plane 2a and the hypothetic emission plane 2b, respectively. In other words, viewing the subject  $Q_s$  from the elementary image optical subsystem 3, the intermediate three-dimensional image  $Q_e$  is reproduced in ~~[[the]]~~ reverse depth, that is, a reverse viewing image.

Please amend paragraph [0049] as follows:

As shown in FIG. 2 and FIG. 3, a design such that the three-dimensional image optical system 1 has a single elementary image optical subsystem 2 and can reproduce a reverse viewing intermediate three-dimensional image  $Q_e$  of the subject  $Q_s$  ~~due to~~ as a result of negative depth magnification has been explained.

Please amend paragraph [0050] as follows:

The third embodiment of the present invention will be further explained where a new effect of employing the plural elementary image optical subsystem 3 is obtained. The system of

the optical design is shown in FIG. 4 wherein two units (referred to as ~~called~~ "the first reverse viewing optical system" and "the second reverse viewing optical system") of elementary image optical subsystems 3 are used with being placed in a separated distance but with the same optical axis is allowed. By using this three-dimensional image optical system, a depth correct image  $Q_r$  can be finally reproduced. In this embodiment, it is preferred that the alignment of the plural elementary image optical subsystems 3 is in-line such that the optical axes of the afocal elements therein are parallel and the central axis of each elementary image optical subsystem 3 is in the same axis.

Please amend paragraph [0053] as follows:

As shown in FIG. 3, the incidence angle  $\varphi_s$  and the emitting angle  $\varphi_e$  ~~[[are]]~~ have the same magnitude but reverse sign in the three-dimensional image optical system 1. Therefore, the same depth correct image  $Q_r$  is reproduced against the subject  $Q_s$  by using  $2n$  ("n" is a natural number) units of the elementary image optical subsystems. Moreover, by differing the incident angle and the launching angle, it is possible to change the image position of the intermediate three-dimensional images  $Q_e$  and the  $Q_r$ .

Please amend paragraph [0054] as follows:

The three-dimensional image is reproduced by the convergence of the lights radiating from a subject  $Q_s$  into an image point  $Q_e$ , wherein the elementary image optical subsystem 3

covers large amount of the radiating lights from the subject Qs. [[Since]] Because the three-dimensional image optical system 1 reproduces the three-dimensional image with the emission angle which is different from the incident angle, the distance of the reproduced three-dimensional image from the second optical component plane is different from the distance of the subject from the first optical component plane. However, these distances are the same when the depth magnification is negative unity.

Please amend paragraph [0055] as follows:

As [[have]] explained above, it is possible to reproduce the intermediate three-dimensional images Qe and Qr which have the horizontal and vertical parallaxes as shown in FIG. 2 and FIG. 4. In the three-dimensional image optical system 1 as shown in FIG. 2 and FIG. 3, it is possible to clearly image the intermediate three-dimensional images Qe and Qr by conforming an optical gobo element 4 such as an optical filter and a thin film to cutoff the light between the afocal optical elements 2. The optical gobo element 4 is ~~place at the place~~ arranged so as to surround the afocal optical elements 2.

Please amend paragraph [0056] as follows:

The optical gobo element 4 can be formed by a junction film between adjacent afocal optical elements 2 or by an adhesive layer to bind the adjacent afocal optical elements 2. The three-dimensional image optical system 1 can more clearly reproduce the intermediate three-

dimensional image Qe and Qr that ~~[[since]]~~ because the optical gobo element 4 cuts the blurred light caused by the scattering of the light traveling in the afocal optical elements 2.

Please amend paragraph [0059] as follows:

For the adjustment of the focal length, it is possible of exchange one of the convex lenses 12a and 12b with another convex lens in this elementary image optical subsystem 3 which is composed of the convex lenses 12a and 12b as afocal optical elements 2. For such exchanging of one of the two convex lenses, the optical gobo element 4 is divided into two portions (not shown in the figures) at the focal point and the elementary image optical subsystem 3 is configured ~~[[in]]~~ such a design that two halves of the desired elementary image optical subsystem 3 are fixed but possible in dismounting and mounting with keeping to face each other.

Please amend paragraph [0063] as follows:

The fifth embodiment of the present invention will be explained, wherein a different combination of the first and the second optical components are employed. As explained above, the three-dimensional image optical systems 1 and 21 are configured with convex lenses 12a and 12b or cylindrical lenses 22a and 22b to conform to the afocal system. However, it is possible to configure the afocal system with ~~a pair of~~ a convex lens and a concave lens. FIG. 6 shows such an afocal system that is similar to a Galilean telescopic lens system. The common focal point of this afocal system is provided by the back focal point of the convex lens which is the first optical

component and the virtual focal point of the concave lens which is the second optical component wherein the front focal point is given by the back side thereof, as shown in FIG. 6. The hypothetical incidence plane 2a locates in the front focal point of the convex lens 32a and the hypothetical emission plane 2b in the back virtual focal point of the concave lens 32b which is actually in the foreside of the concave lens 32b. The plural afocal optical elements 32 of such lens configuration which is aligned in a planar array provides another elementary image optical subsystem 33 that functions another elementary image optical subsystem 33 and a three-dimensional image optical system 31. A feature of the three-dimensional image optical systems 31 using this afocal system is to reproduce ~~[[the]]~~ a depth-normal image.

Please amend paragraph [0064] as follows:

The image of the subject is not reproduced in this afocal system ~~[[since]]~~ because the concave lens 32b which is the second optical component has no optical convergence capability. However, the second optical component generates an apparent image in the virtual focal point as the property of a concave lens 32b. The angular magnification and the depth magnification are compliant to the equation (8) using  $\phi_s(+)$  and  $\phi_e(+)$ , therefore it should be noted that the depth magnification is positive.

Please amend paragraph [0066] as follows:

The sixth embodiment of the present invention will be explained wherein new optical

components using a distributed index in the mother glass are used. According to the availability of variation of the lenses, the optical components are not confined to be convex lenses or concave lenses but Radial GRIN lenses can be used. One of the features of radial GRIN lenses is the ~~casiness~~ ease of mounting for assembly. FIG. 7 is a schematic that shows the arrangement of the optical components and FIG. 8 shows the detail dimensional design to achieve the afocal system. As shown in FIG. 7, the first radial GRIN lens 42 and the second radial GRIN lens 42b are used for the first optical component and the second optical component. These two radial GRIN lenses 42a and 42b are separately aligned in the common optical axis so that the focal points of the first and the second radial GRIN lenses 42a and 42b coincide at the common focal point locating on the common optical axis. The afocal optical element 43 comprises these two radial GRIN lenses 42a and 42b and plural afocal optical elements arranged in a planar array construct the elementary image optical subsystem 43.

Please amend paragraph [0067] as follows:

The radial GRIN lens 42a has a distributed refractive index  $n$  given by eq. (11). The distribution of the refractivity is large in the center and small in the periphery. Once a meridional serpentine period  $P (=2\pi/A^{1/2})$  is defined as a normalized period length  $\theta$ , one of designs for the separation length of the first and the second radial GRIN lenses is under the condition as  $0 < \theta < 1/2$ . For a particular design of the present invention, the first radial GRIN lens 42a has  $\theta = 1/8$  and the second radial GRIN lens 42b has  $\theta = 1/16$ . Then the physical design of the afocal system



can be designed by the equation (11) to (13) and the separation of the two radial GRIN lenses are design as shown by ~~FIG. 7.7~~ in FIG. 7.

Please amend paragraph [0069] as follows:

For this three-dimensional image optical system 41, two optical components are constructed by the radial GRIN lenses 42a and 42b where the focal length is determined by the length thereof. By using these radial GRIN lenses 42a and 42b, therefore, it is possible to configure ~~[[the]]~~ a similar three-dimensional image optical systems 1 as shown in FIG. 1, FIG. 2, FIG. 3 and FIG. 4, regardless to the angular magnifications of the afocal optical element 2.

Please amend paragraph [0070] as follows:

By using the radial GRIN lenses, it is possible to construct the afocal optical element 32 as shown in FIG. 4 where a convex lens and a concave lens are employed. The detail design is explained with the reference to FIG. 8. The afocal system comprises the first radial GRIN lens 52a and the second radial GRIN lens 52b which are compliant to the equation (11) and (14), respectively. The meridional serpentine period  $P (=2\pi/A^{1/2})$  as a period length  $\theta$  is conditioned to the first radial GRIN lens 52a with  $0 < \theta < 1/2$  and to the second radial GRIN lens 52b with  $1/2 < \theta < 1$ . ~~We select the period~~ Period lengths  $\theta = 1/16$  (same as shown in eq. (12)) and  $\theta = 4/5$  are selected for the first and the second radial GRIN lenses 52a and 52b, respectively.

$$\begin{aligned}
 \theta &= \sqrt{A}Z_u = 2\pi \times \frac{4}{5} = \frac{8\pi}{5} \\
 f_1 = f_2 &= \frac{1}{n_0 \sqrt{A} \sin \frac{8\pi}{5}} = \frac{-1.05}{n_0 \sqrt{A}} = -1.05L_c \\
 h_1 = h_2 &= \frac{1}{n_0 \sqrt{A}} \tan \frac{\theta}{2} = \frac{1}{n_0 \sqrt{A}} \tan \frac{4\pi}{5} = \frac{-0.726}{n_0 \sqrt{A}} = -0.73L_c \\
 s_1 = s_2 &= \frac{1}{n_0 \sqrt{A} \tan \theta} = \frac{1}{n_0 \sqrt{A} \tan \frac{8\pi}{5}} = \frac{-0.32}{n_0 \sqrt{A}} = -0.32L_c
 \end{aligned} \tag{14}$$

Please amend paragraph [0073] as follows:

The three-dimensional image optical systems 31, 41, 51 as shown by FIGS. 6, 7 and 8 can adopt an optical gobo element 34 which has a gobo effect. By using the optical gobo element, the light scatter at an afocal optical element does not go into the adjacent afocal optical elements. Therefore, the cross over of the lights is suppressed and clear intermediate three-dimensional images Qe and Qr are obtained. The optical gobo elements 4 and 34 can be a cylindrical circumference to the afocal optical element 2 and 32. The cement to assemble the afocal optical element to construct the elementary image optical subsystem 3 and the mounting frame of the afocal optical element 2 and 32 can be [[the]] gobo effect materials.

Please amend paragraph [0076] as follows:

By using the three-dimensional image optical system 1, 21 or 41 for a part or the whole of the show windows of shops or department stores, the commercial goods ~~locating~~ located inside

the show window can be imaged out of the show windows so that the exhibition for the commercial goods can be strikingly stood out. ~~A "catch eye"~~ An "eye-catching" effect can be expected for the use of the present invention.

Please amend paragraph [0077] as follows:

In case of the museums and art museums to show a precious exhibit, it is necessary to keep the ~~visitor off~~ visitors a certain distance away from the exhibit. The three-dimensional image optical system 1 (or 21) allows the visitors to see the exhibit in a close position.

Please amend paragraph [0079] as follows:

As shown in FIG. 9, the three-dimensional image optical system 1 composed of the two elementary image optical subsystems 3 and the subject which is a precious exhibit are put beyond the window glass 7 that segregates them from the visitors. The emission plane of the second elementary image optical subsystem 3 faces ~~[[to]]~~ the visitors and the intermediate three-dimensional image  $Q_e$  is reproduced beyond the window glass 7 and the three-dimensional image  $Q_r$  is reproduced in the limit zone into which the visitors are kept off by a low fence 8. Each of the elementary image optical subsystems 3 has an array on which afocal optical elements 2 are arranged and the optical gobo element 4 are formed around the afocal optical elements 2. For the purpose of specific observation of the visitors, other three-dimensional image optical systems as 21, 31 and 41 can be used where cylindrical lenses 22a and 22b, a convex lens 32b

and radial GRIN lenses 42a and 42b can be used.

Please amend paragraph [0080] as follows:

By using the three-dimensional image optical system 1, 21 and 41, the 3D three-dimensional image can be reproduced and an exhibition with high fidelity is possible. Moreover, it can improve the working efficiency by precise visual recognition and the exhibition for the commercial goods can be strikingly stood out. ~~A "catch-eye"~~ An "eye-catching" effect can be obtained. It is possible to reproduce a three-dimensional erect image by using the three-dimensional image optical subsystem 31 and 51 which respectively comprise an elementary image optical subsystem 33.

Please amend paragraph [0086] as follows:

[[Since]] Because the three-dimensional image optical system has two convex lenses aligned with a common axis and the convex lens is aligned on a same plane, it is possible to reproduce a three-dimensional optical image on the common axis by [[the]] emitting light under the a focal optical system. [[Since]] Because a focal lens pair of which two convex lenses have different focal length, it is possible to manufacture a variety of elementary image optical subsystems by alternating one of the paired lenses for the afocal optical element.

Please amend paragraph [0087] as follows:

The three-dimensional image optical system as shown in FIG. 5 ~~[[have]]~~ has a plurality of cylindrical lenses for afocal optical elements, therefore it is easy to handle and manufacture the plurality of elementary image optical subsystems. For the application of reproducing the horizontal parallax three-dimensional optical image, the present afocal optical elements can be used.

Please amend paragraph [0091] as follows:

The three-dimensional image optical system can reproduce the three-dimensional optical image in a remote distance from the actual subject, therefore it is possible for the viewers to recognize the position of the precious exhibit is close even it is exhibited further from the viewers. This assists a remote observation of the precious exhibit or harmful materials in nuclear plants. It is also possible the commercial goods displayed in the show window is reproduced outside the show window. The three-dimensional image ~~of the 3D~~ can be reproduced closed to the observer by which it is possible to improve the working efficiency such that the exhibition for the commercial goods can ~~[[be]]~~ strikingly ~~[[stood]]~~ stand out and the harmful material or substance can be monitored in a close view.